

## Bottlenose Dolphins in the Atlantic and Gulf of Mexico (*Tursiops truncatus*)

Bottlenose dolphins are cosmopolitan in distribution, occurring in most coastal areas in temperate and tropical regions of the world. They are the most common marine mammal along the U.S. southeastern and Gulf of Mexico coasts. In the western North Atlantic, bottlenose dolphins belong to either of two different ecotypes—coastal or offshore. These ecotypes are distinguished on the basis of their distribution, genetic composition, morphology, parasites, and prey. Relatively little is known about the distribution of the offshore ecotype, which typically occurs in deep waters of the continental shelf and inner continental slope. In coastal areas dolphins occur along the outer coastline and in bays, sounds, inlets, estuaries, and other inland waters.

Within these ecotypes, bottlenose dolphins comprise different stocks—groups of animals that are more or less reproductively isolated from other groups within the same ecotype. The degree of reproductive isolation is important not only because it serves as a basis for genetic and evolutionary separation of stocks, but also because it is a determinant of a stock's vulnerability to, and ability to recover from, both natural and human-related adverse influences. Efforts to distinguish reproductive stocks are complicated by the difficulty of studying these animals in their natural environment, by the fact that animals from different stocks cannot be separated on the basis of appearance, and by the fact that different stocks sometimes have geographic ranges that overlap temporally and spatially.

In 1987 and 1988 a large number of bottlenose dolphins stranded along the eastern coast of the United States. The geographical pattern of the die-off was taken as evidence of a single coastal migratory stock. In 1993 the National Marine Fisheries Service designated that stock as depleted under the Marine Mammal Protection Act. In 1997, 10 years after the die-off, the Service established a research program to investigate stock structure, primarily using genetics, but also using photo-identification, telemetry, stable isotope ratios, and information from strandings. Initial efforts have fo-

cused along the Atlantic coast because this region includes the depleted, provisional coastal migratory stock and because of documented high levels of incidental take in gillnet fisheries in the coastal waters of the mid-Atlantic.

Preliminary results have provided additional insights into possible stock structure along the Atlantic coast and suggest the possibility of at least seven stocks of the coastal ecotype (Fig. 20). These apparent stocks consist of migratory animals as well as year-round and seasonal residents in bays, sounds, and estuaries of the mid-Atlantic and southeastern states. Little work has been done to delineate stocks south of the North Carolina/South Carolina border; several stocks may occur along the coast and in the estuaries and bays of South Carolina, Georgia, and the east coast of Florida. The bottlenose dolphin take reduction team convened by the National Marine Fisheries Service in 2001 is operating under the assumption that seven coastal bottlenose dolphin stocks exist in coastal waters of the western North Atlantic.

Between 1992 and 1998 the Service conducted six abundance surveys between New York and Florida; a comprehensive survey was carried out in 2002. Estimating the abundance of bottlenose dolphins is complicated by the difficulties associated with distinguishing coastal and offshore ecotypes, seasonal movement patterns that result in overlapping distribution of the coastal stocks, the difficulty of covering the majority of the Atlantic coast in a single survey, and uncertainty about the best analytic methods. The results of the most recent survey were being analyzed at the end of 2002 and are expected to be available in the first half of 2003. Existing information is insufficient for trend analysis for any of the stocks in the coastal waters of the Atlantic coast. Offshore bottlenose dolphins in the western North Atlantic have an estimated population size of 30,633 based on two large-vessel surveys conducted in 1998, but this estimate is confounded by some of the same assessment problems.

Similar issues arise in the Gulf of Mexico, where stock structure is even less clear. In March 2000 the Service hosted a meeting in Sarasota, Florida, to discuss the most efficient ways to resolve questions about the species' stock structure in the Gulf. Service personnel presented a brief report of that meeting to the Commission at its 2000 annual meeting in St. Petersburg Beach,

Florida, and indicated that funds would be sought to begin a comprehensive research program similar to that now under way along the Atlantic coast. In a 12 December 2000 letter to the National Marine Fisheries Service, the Commission agreed that comprehensive studies along the Atlantic coast provided a good framework for future dolphin research in the Gulf of Mexico. The Commission commended the Service for its efforts in this regard and urged it to expedite funding for such re-

search. As of the end of 2002, the Service's Southeast Fisheries Science Center was seeking, but had not yet received, funding to conduct comprehensive bottlenose dolphin studies in the Gulf of Mexico.

Lacking better information, the Service currently recognizes 38 stocks in the Gulf of Mexico region (outer continental shelf, continental shelf edge and continental slope, western coastal, northern coastal, eastern coastal, and 33 resident stocks

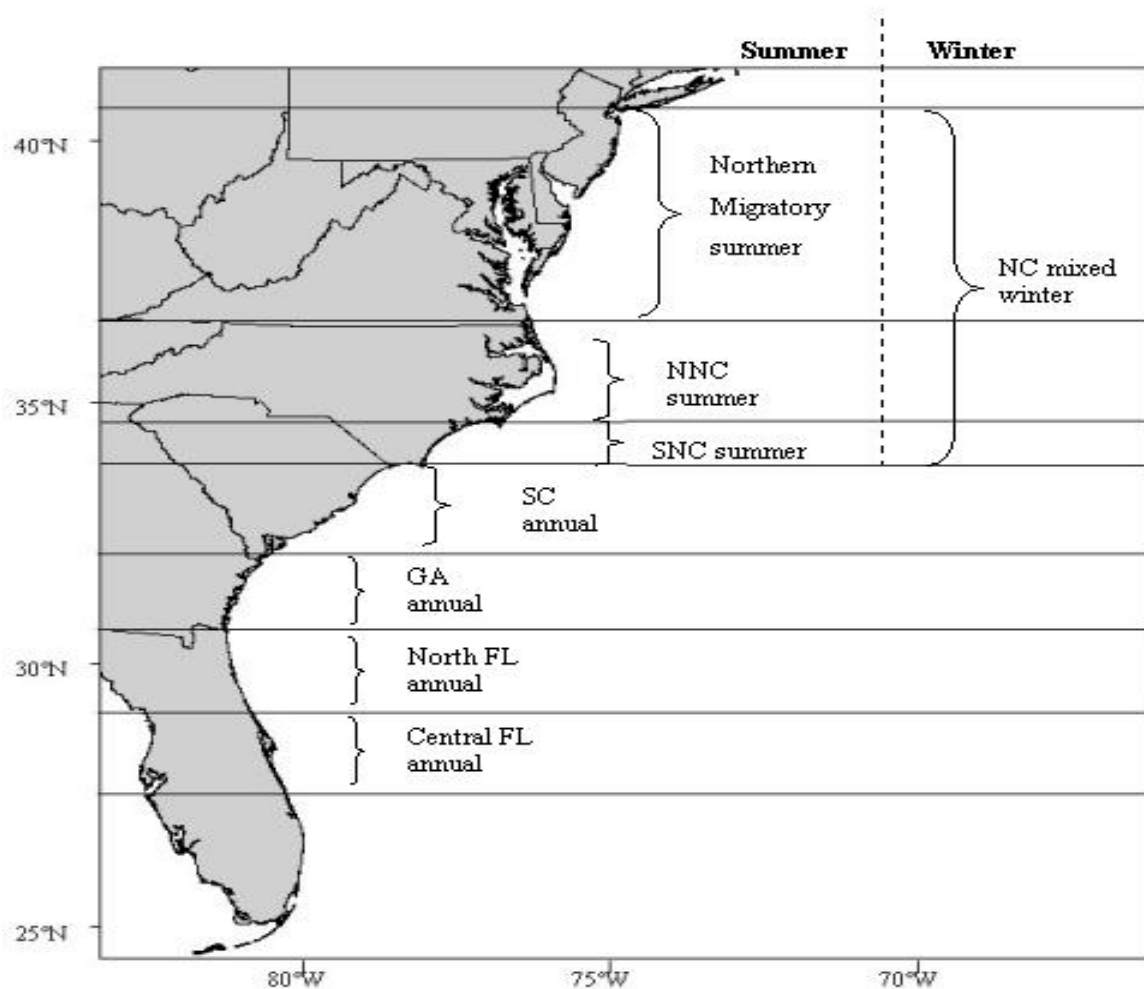


Figure 20. Current management unit delineations used by the Mid-Atlantic Bottlenose Dolphin Take Reduction Team.

in contiguous, enclosed, or semienclosed bodies of water adjacent to the Gulf of Mexico). For most of these stocks, abundance estimates are outdated and therefore unreliable. Existing information is insufficient for trend analysis for most currently recognized stocks of bottlenose dolphins in the Gulf of Mexico.

The lack of information on bottlenose dolphin stock structure in these regions is a major impediment to assessment of their status and trends, which are most meaningfully described on the basis of reproductively discrete stocks. Similarly, the lack of information on stock structure impedes the analysis of effects from die-offs, fisheries interactions, coastal development, oil and gas operations, and other factors that pose potential threats to bottlenose dolphins. However, determining the status of and risks to stocks will be difficult even after stocks have been identified.

### Threats to Bottlenose Dolphin Stocks

A variety of factors, both natural and human-related, may threaten the well-being of individual dolphins or the status of dolphin stocks. Natural factors include predation by large sharks, disease, parasites, exposure to naturally occurring biotoxins, changes in prey availability, and loss of habitat due to environmental variation. Human-related factors include loss of habitat due to coastal development, exposure to pollutants, disturbance, vessel strikes, entanglement in debris, noise and pollution related to oil and gas development, direct and indirect interactions with recreational and commercial fisheries, and injury, mortality, or behavior modification that may result from direct human interactions such as the feeding of wild dolphins. These factors may act independently or synergistically. For example, exposure to pollutants may reduce immune system function, thereby lowering resistance to disease; human-related contamination of coastal waters may increase the likelihood of phytoplankton blooms that result in increased concentrations of biotoxins; or direct interactions such as feeding of dolphins may increase the likelihood of dolphin injury or mortality due to vessel strikes. Compared with offshore bottlenose dolphins, coastal dolphins may be at greater risk to human-related threats due to their greater proximity to human activities.

**Die-Offs**—The effects of various threats to bottlenose dolphins in the southeastern and mid-

Atlantic United States have manifested themselves most obviously in a series of at least six die-offs observed over the past 15 years. Animals stranded on beaches provide the most obvious evidence of a die-off, but it is not clear that those animals provide a complete and reliable basis for characterizing total mortality during an event (e.g., some dead, stranded animals may not be found; some dead animals may not strand or wash ashore; and stranded animals may wash up great distances from the location of their death).

The most recent known die-off of bottlenose dolphins in the southeastern United States occurred from May to August 2001 in the vicinity of the Indian River Lagoon along the eastern coast of Florida. At least 35 animals died, and the cause of death is under investigation. During the height of the mortality event, fish, crab, and seabird kills also occurred in the lagoon. Scientists attributed these deaths to low levels of dissolved oxygen. Because of several cases of human illness due to the consumption of pufferfish containing saxitoxin, there have been subsequent investigations into whether the dolphin mortality event could be attributed to saxitoxin poisoning via pufferfish. Such events are of concern not only because of their impact on the local populations, but also because they may serve as general indicators of the health of coastal ecosystems.

The effect of a die-off on a particular stock of dolphins can only be determined if that stock has been identified and sufficient background information exists to put the die-off in perspective. Such information includes stock abundance, status and trends, and composition. Because the stock structure of bottlenose dolphins along the southeastern coast and in the Gulf of Mexico is poorly understood, as are the abundance, status, and trends of each stock, it is difficult to determine the significance of the observed die-offs.

**Contaminants**—Bottlenose dolphins, particularly those occurring in coastal and inland waters, are exposed to contaminants from a variety of sources including agricultural and residential runoff, deposition of airborne pollutants, vessel discharges, pollution from oil and gas exploration and drilling, and sewage and other waste from coastal developments. Although a considerable number of studies have documented the presence and increasing concentration of contaminants in marine mammal tissues (including those of bottle-

nose dolphins), the effects of those contaminants on the health of both individuals and marine mammal populations have been difficult to assess. Based on studies of other species, the potential effects of contaminants are direct health risks to individual animals (e.g., impairment of immune function) as well as impairment of their ability to reproduce. Contaminant loads for some chemicals may increase over time due to bioaccumulation, and some contaminants may be passed directly from mother to fetus.

In December 1998 the Commission recommended that the National Marine Fisheries Service consult with the Environmental Protection Agency, the Minerals Management Service, and relevant coastal state agencies to determine what was being done to assess the sources, levels, and effects of anthropogenic contaminants present in bottlenose dolphins in waters of the U.S. Atlantic and Gulf states. In December 2000 the Commission recommended that the Service initiate carefully controlled experiments and testing to clarify the effects of anthropogenic toxins on individual dolphins and on dolphin populations. The Commission noted that both the report of the Commission's October 1998 workshop on marine mammals and persistent ocean contaminants and a 1998 report by the International Whaling Commission Scientific Committee recommended using index populations of marine mammals, including bottlenose dolphins, in a multifaceted research approach combining behavioral observations, life history research, ecological assessment, health monitoring, and toxicology. The Service provided \$25,000 and \$36,000 in 2001 and 2002, respectively, for studies of the effects of organochlorine contaminants and mercury/selenium dynamics on the Sarasota Bay population of dolphins. Preliminary results from these studies indicate that concentrations of organochlorines in dolphin blubber, milk, and plasma are of potential health concern for first-born calves and for males as they age and accumulate high concentrations of contaminant residues. Females that have given birth to more than one calf carry lower concentrations in their tissues as a result of passing contaminants via placenta and milk.

**Tourism and Direct Human Interactions**—In recent years, commercial ventures that encourage close and sometimes illegal interactions between humans and dolphins have proliferated in

the southeastern United States (see also Chapter IX). These ventures offer members of the public a variety of experiences from watching to swimming with wild dolphins. In some cases, these activities constitute harassment, whereas in others the legal status is less clear. The feeding of free-ranging dolphins, an activity explicitly prohibited under National Marine Fisheries Service regulations, also has persisted in various locations.

To document the extent, nature, and effects of such activities, the Commission contracted for a study to (1) review the literature on the topic of human-dolphin interactions and (2) quantify and describe the development of swim-with-the-dolphin programs in the Florida panhandle. The study was completed in April 2000 (see Appendix B; Samuels and Bejder 1998). Although the report acknowledged a lack of information about the effects of human-dolphin interactions, it concluded that (1) dolphins are vulnerable to injury and death as a result of human contact; (2) animals appearing tolerant or even seeking such contact have already been placed at risk by extensive habituation achieved through considerable human effort; (3) such contact can disrupt important natural behaviors of wild dolphins; and (4) a precautionary approach is necessary to ensure the protection of wild dolphins from the adverse effects of human-dolphin interactions.

At the Commission's 2000 annual meeting, representatives of the Service reviewed the status of such activities in the southeastern United States and expressed concern about the individual and cumulative effects of close interactions between humans and dolphins. They advised the Commission that new draft regulations to address these interactions would soon be circulated to the Commission and other agencies for comment. In its 12 December 2000 letter to the Service, the Commission commended such efforts and urged haste in adopting clear, rational regulations and guidelines. The Commission also urged the Service to consult with other involved agencies (e.g., the Fish and Wildlife Service and the public display industry) to assure that a consistent message reached the public. The Commission noted that patrons of public display facilities offering swim-with-the-dolphin or dolphin-feeding exhibits may be confused about what constitutes appropriate behavior with marine mammals in the wild and that regulations adopted by the Service should be consistent



with those issued by the Fish and Wildlife Service for species under its charge.

In July 2001 the National Marine Fisheries Service consulted with the Commission regarding a draft policy developed to address the issue of interactions between the public and marine mammals in the wild. The policy was intended to clarify those interactions constituting harassment. In its 16 July 2001 letter responding to the Service, the Commission expressed its understanding that the Service still intends to promulgate regulations clarifying those interactions between the public and wild marine mammals that constitute harassment. The Commission agreed that the policy would help provide the public with needed guidance regarding such activities until appropriate regulations could be implemented. On 30 January 2002 the Service published an advanced notice of proposed rulemaking in the *Federal Register* requesting comments on types of regulations and other measures that would be appropriate to prevent harassment of marine mammals. At the end of 2002 the Service had taken no further action on these regulations.

Enforcement is an important element of management efforts to avoid harassment of bottlenose dolphins (and other marine mammals) by direct human interaction. At the Commission's 2000 annual meeting, representatives of the Service discussed problems relating to inadequate and ineffective enforcement of regulations intended to protect bottlenose dolphins and other marine life. They noted that enforcement has been compromised by an inadequate number of enforcement officers, the extensive coastline to be covered, and the large number of competing, high-priority demands requiring attention (e.g., investigation of interactions between shrimp fisheries and turtles). In its 12 December 2000 letter to the Service, the Commission strongly recommended that staffing and efforts be increased significantly, not only for bottlenose dolphins, but also for other species for which the Service is responsible. The letter noted that the Commission also had urged both the Fish and Wildlife Service and the Florida Division of Law Enforcement to increase their enforcement capabilities. Finally, the letter recommended that the Service develop a coordinated enforcement strategy involving all three agencies in Florida. At the Commission's 2002 annual meeting in San Diego, the issue of enforcement arose again with respect

to the harassment of Hawaiian spinner dolphins (see Chapter IX).

## **Fisheries Interaction and Take Reduction Efforts**

Bottlenose dolphins interact with commercial and recreational fisheries throughout their range along the southeastern North Atlantic and Gulf of Mexico coasts. They may be killed or seriously injured incidental to a variety of fishing operations and gear types including gillnets, crab pots, haul/beach seines, long-haul seines, pound nets, and stop nets. They also may be injured or killed by consuming fish caught by hook-and-line fisheries or taken as bycatch in fishery-generated debris such as lost netting and lines.

Evidence and estimates of fishery interactions suggest that fishery-related mortality exceeds the potential biological removal level of several coastal stocks depleted by the 1987–1988 die-off and thus may be impeding their recovery. Therefore, the National Marine Fisheries Service convened a take reduction team in November 2001 to begin the process of developing a plan to reduce the fishery-related take of bottlenose dolphins along the eastern North Atlantic coast from New Jersey southward. The team consists of representatives of the different fisheries involved, that Atlantic States Marine Fisheries Commission, the Mid-Atlantic Fishery Management Council, the South Atlantic Fishery Management Council, the National Marine Fisheries Service, fishery management agencies of the affected states, universities in the regions affected, conservation organizations, animal welfare organizations, and the Marine Mammal Commission.

The take reduction team met four times in 2002. Progress was hampered by lack of scientific and observer data, particularly on abundance and bycatch mortality. Therefore, devising mitigation measures that were both palatable to all stakeholders and that the Service could show would significantly decrease bycatch proved difficult. Despite these problems, the team reached consensus on a plan on 25 April 2002. The plan consisted of a mix of education and outreach programs, research needs, and regulatory measures, such as limits on mesh size and soak times. On 15 August 2002 take reduction team members were notified by the National Marine Fisheries Service that, for some of the management units (i.e., stocks), the regulatory

measures were inadequate to reduce mortality and serious injury of bottlenose dolphins to below the potential biological removal level. Therefore, the team will reconvene in April 2003 to attempt to reach consensus on more effective measures.

On 4 November 2002 the Commission responded by letter to a *Federal Register* notice from the National Marine Fisheries Service requesting comments on its intent to prepare an environmental impact statement on the bottlenose dolphin take reduction plan. The letter highlighted the importance of obtaining adequate information to evaluate the alternatives in the environmental impact statement. Specifically, the Commission noted the need for reliable information on the stock structure of the affected bottlenose dolphins, abundance of each stock, potential biological removal levels, and levels of incidental mortality and serious injury in the fisheries after the implementation of take reduction measures.

### Conservation Plan

As described in previous annual reports, the Commission has recommended repeatedly that the National Marine Fisheries Service develop and implement a bottlenose dolphin conservation plan for the putative western North Atlantic coastal migratory stock. As noted above, this stock was declared depleted in 1993, based on estimates that it may have declined by more than 50 percent as a result of the 1987–1988 die-off. On 25 May 2001, almost 15 years after the die-off and 8 years after the depleted designation, a draft plan was forwarded to the Commission for review and comment. The draft plan provided an overview of the species' history, a review of its natural history characteristics, a summary of known and possible human-related and natural factors that may threaten the population or impede its recovery, an outline of needed and prioritized research

and conservation actions, a schedule for implementing those actions, and their projected costs. Necessary actions included (1) identification of stock structure of coastal bottlenose dolphins, (2) estimation of abundance for each stock, (3) assessment of human-related sources of mortality for each stock, (4) assessment of the overall status of each stock, (5) retrospective analysis of the 1987–1988 die-off, (6) establishment of a biomonitoring program to assess the incidence of disease, (7) examination and characterization of factors that could change carrying capacity for bottlenose dolphin stocks, and (8) establishment of a coordinator position to ensure implementation of the plan.

The draft plan also suggested that, in the absence of information to determine the stock's optimum sustainable population level (i.e., that level above which the population would no longer be considered depleted), the time to recovery could be estimated using model simulations if human-related mortality of dolphins remains under the potential biological removal level.

By letter of 15 June 2001 the Marine Mammal Commission commended the Service and its contractors on the overall quality of the conservation plan and provided comments. The Commission's two main questions were whether the Service has adequate funding to implement the plan and whether the Service would prepare a similar plan for bottlenose dolphins in the Gulf of Mexico, where dolphin populations are threatened by many of the same problems observed along the Atlantic coast. The Commission also encouraged the Service to release the plan to the public for further comment. As of 31 December 2002 the Service was updating the plan with the new information on stock structure, abundance, and take reduction efforts. It anticipated release of the draft plan for public comment in early 2003.